WHAT IS CLAIMED IS:

1. A method for obtaining a numerical value from a fingerprint comprising the steps of:

enhancing a scanned image of the fingerprint;

restoring the enhanced image;

binarizing the restored image;

thinning the binarized image;

detecting a core point in the thinned image;

detecting minutiae within a predetermined radius from the core point; and

extracting the numerical value by computing relations of the minutiae to the core point.

2. The method of claim 1, wherein the step of enhancing comprises the steps of:

enhancing the contrast of each ridge in the image;

filtering noise;

partition a ridge area from a blank area by sharpening edges of each ridge; and

smoothening rough edges of each ridge.

3. The method of claim 1, wherein the step of restoring comprises the steps of:

correcting geometric distortion of the image; and

applying inverse filtering to the image.

4. The method of claim 1, wherein the step of restoring comprises the steps of:

correcting geometric distortion of the image; and

applying least square filtering to the image.

5. The method of claim 1, wherein the step of binarizing comprises the step of converting the image to a black and white image.

6. The method of claim 1, wherein the step of binarizing comprises the steps of:

setting a predetermined threshold level;

changing a point in a line to a black color if the point intensity is lower than the threshold value.

7. The method of claim 1, wherein the step of binarizing comprises the steps of:

partitioning the image into a plurality of smaller areas;

computing average intensity level of line within each smaller area;

setting the intensity level of each smaller area as a threshold level for the respective area; and

transforming gray-scale image of each smaller area to a binary image.

8. The method of claim 1, wherein the step of thinning comprises the step of reducing the width of each black line in the image to one pixel.

9. The method of claim 1, wherein the step of detecting a core point comprises the steps of:

determining a core area; and

detecting a core point in the determined core area.

10. The method of claim 9, wherein the step of determining a core area comprises the steps of:

segmenting the image into smaller areas;

applying a FFT process to each segmented smaller area;

extracting a direction line for each line in the each smaller area to obtain an image of a respective directional straight line for each smaller area;

classifying each directional line to a vertical, a horizontal, a left slope, and a right slope type;

assigning a respective flag to each of the classified

directional lines to obtain a matrix with columns and rows, wherein each column of the matrix includes a plurality of smaller areas;

determining a core area in a column with most number of vertical directional lines; and

determining a core area in a segmented smaller area whose each of its upper smaller areas in the respective column include a vertical directional lines.

11. The method of claim 10, wherein the step of determining a core point in the determined core area comprises the steps of:

segmenting the determined core area into smaller squares;

applying a FFT process to each segmented smaller square;

extracting a direction line for each line in the each smaller square to obtain an image of a directional straight line for each smaller square;

classifying each directional line to a vertical, a horizontal, a left slope, and a right slope type;

assigning a respective flag to each of the classified directional lines to obtain a matrix with columns and rows, wherein each column of the matrix includes a plurality of squares;

determining a core square in a column with most number of vertical directional lines;

determining a core square in a segmented smaller square whose each of its upper smaller squares in the respective column include a vertical directional lines; and

determining a highest pixel on a ridge line in the core square.

12. The method of claim 1, wherein the step of detecting minutiae comprises the step of detecting bifurcation minutiae.

13. The method of claim 12, wherein the step of detecting minutiae comprises the steps of:

dividing the image to a plurality of 3 X 3 pixel squares;

for each of the plurality of squares:

counting the number of color changes from black to white, starting at the center pixel;

assigning the number to the central pixel; and

determining pixels with an assigned number of 3 as bifurcation minutiae.

14. The method of claim 1, wherein the step of extracting the numerical value comprises the steps of:

ordering the detected minutiae by their respective distance from the detected core point as b_1, b_2, b_3, .. b_n, wherein b is a detected minutia and n is the total number of detected minutiae;

computing a distance between the core point and b_1 as d_1;

computing a distance between b_1 and b_2 as d_2;

computing a radius r_1 of a circle including the core point, b_1, and b_2 on its circumference;

for each of the remaining minutiae b_i, from b_3 to b_n:

computing a distance between b_{i-1} and b_i as d_i;

computing a radius r_{i-1} of a circle including b_{i-2}, b_{i-1}, and b_i on its circumference; and

assembling the numerical value by combining $d_1d_2r_1d_3r_2d_4r_3$ $....d_n r_{n-1}$.

15. The method of claim 1, further comprising the step of utilizing the extracted numerical value as a key for data encryption.

16. The method of claim 1, further comprising the step of utilizing the extracted numerical value for data authentication for online shopping.

17. The method of claim 1, further comprising the step of utilizing the extracted numerical value for a cardless secure transaction.

18. The method of claim 1, wherein the transaction is performed over the Internet.

19. A fingerprint scanning device comprising:

means for scanning a fingerprint for obtaining a fingerprint image;

means for enhancing the fingerprint image;

means for restoring the fingerprint image;

means for binarizing the fingerprint image;

means for thinning the fingerprint image;

means for detecting a core point in the fingerprint image;

means for detecting minutiae within a predetermined radius from the core point; and

means for extracting the numerical value by computing relations of the minutiae to the core point.

20. The device of claim 19, wherein the means for enhancing comprises:

means for enhancing the contrast of each ridge in the image;

means for filtering noise;

means for partition a ridge area from a blank area by sharpening edges of each ridge; and

means for smoothening rough edges of each ridge.

21. The device of claim 19, wherein the means for restoring comprises:

means for correcting geometric distortion of the image; and

means for applying inverse filtering to the image.

22. The device of claim 19, wherein the means for restoring comprises:

means for correcting geometric distortion of the image; and

means for applying least square filtering to the image.

23. The device of claim 19, wherein the means for

binarizing comprises means for converting the image to a black and white image.

24. The device of claim 19, wherein the means for binarizing comprises:

means for setting a predetermined threshold level;

means for changing a point in a line to a black color if the point intensity is lower than the threshold value.

25. The device of claim 19, wherein the means for binarizing comprises:

means for partitioning the image into a plurality of smaller areas;

means for computing average intensity level of line within each smaller area;

means for setting the intensity level of each smaller area as a threshold level for the respective area; and

means for transforming gray-scale image of each smaller area to a binary image.

26. The device of claim 19, wherein the means for thinning comprises means for reducing the width of each black line in the image to one pixel.

27. The device of claim 19, wherein the means for detecting a core point comprises:

means for determining a core area; and

means for detecting a core point in the determined core area.

28. The device of claim 27, wherein the means for determining a core area comprises:

means for segmenting the image into smaller areas;

means for applying a FFT process to each segmented smaller area;

means for extracting a direction line for each line in the each smaller area to obtain an image of a respective directional straight line for each smaller area;

means for classifying each directional line to a vertical, a horizontal, a left slope, and a right slope type;

means for assigning a respective flag to each of the classified directional lines to obtain a matrix with columns and rows, wherein each column of the matrix includes a plurality of smaller areas;

means for determining a core area in a column with most number of vertical directional lines; and

means for determining a core area in a segmented smaller area whose each of its upper smaller areas in the respective column include a vertical directional lines.

29. The device of claim 28, wherein the means for determining a core point in the determined core area comprises:

means for segmenting the determined core area into smaller squares;

means for applying a FFT process to each segmented smaller square;

means for extracting a direction line for each line in the each smaller square to obtain an image of a directional straight line for each smaller square;

means for classifying each directional line to a vertical, a horizontal, a left slope, and a right slope type;

means for assigning a respective flag to each of the classified directional lines to obtain a matrix with columns and rows, wherein each column of the matrix includes a plurality of smaller squares;

means for determining a core square in a column with most number of vertical directional lines;

means for determining a core square in a segmented smaller area whose each of its upper smaller areas in the respective column include a vertical directional lines; and

means for determining a highest pixel on a ridge line in the core square.

30. The device of claim 19, wherein the means for detecting minutiae comprises means for detecting bifurcation minutiae.

31. The device of claim 30, wherein the means for detecting minutiae comprises:

means for dividing the image to a plurality of 3 X 3 pixel squares;

for each of the plurality of squares:

means for counting the number of color changes from black to white, starting at the center pixel;

means for assigning the number to the central pixel; and

means for determining pixels with an assigned number of 3 as bifurcation minutiae.

32. The device of claim 19, wherein the means for extracting the numerical value comprises:

means for ordering the detected minutiae by their respective distance from the detected core point as b_1, b_2, b_3, .. b_n, wherein b is a detected minutia and n is the total number of detected minutiae;

means for computing a distance between the core point and b_1 as d_1;

means for computing a distance between b_1 and b_2 as d_2;

means for computing a radius r_1 of a circle including the core point, b_1, and b_2 on its circumference;

for each of the remaining minutiae b_i, from b_3 to b_n:

means for computing a distance between b_{i-1} and b_i as d_i;

means for computing a radius r_{i-1} of a circle including b_{i-2}, b_{i-1}, and b_i on its circumference; and

means for assembling the numerical value by combining $d_1 d_2 r_1 d_3 r_2 d_4 r_3 \ldots . d_n r_{n-1}$.

33. The device of claim 19, further comprising means for utilizing the extracted numerical value as a key for data encryption.

34. The device of claim 19, further comprising means for utilizing the extracted numerical value for data authentication for online shopping.

35. The device of claim 19, further comprising means for utilizing the extracted numerical value for a cardless secure transaction.

36. The device of claim 19, wherein the transaction is performed over the Internet.

37. A computer readable medium having stored thereon a set of instructions including instruction for obtaining a numerical value from a fingerprint, the instructions, when executed by a computer cause the computer to perform the steps of:

enhancing a scanned image of the fingerprint;

restoring the fingerprint image;

binarizing the fingerprint image;

thinning the fingerprint image;

detecting a core point in the fingerprint image;

detecting minutiae within a predetermined radius from the core point; and

extracting the numerical value by computing relations of the minutiae to the core point.